Original Article

Success Rate of Pulpectomy in Primary Teeth Using Various Obturation Techniques

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ABSTRACT:

Background: *Despite the variety of obturation techniques available, no single method has been established as the ideal approach for obturating primary tooth root canals. The purpose of the study is to compare the success rate of pulpectomy in primary teeth using different obturation techniques.*

Aim of the study: *The aim of the study is to compare the success rate of pulpectomy in primary teeth using different obturation techniques.*

Methods: *This prospective comparative study was conducted at the Department of Dentistry, Bangladesh Shishu Hospital & Institute, from January 2023 to January 2024. Forty healthy children (aged 4–8 years) with 60 primary molars requiring pulpectomy were randomly assigned to three obturation groups (Disposable Syringe, Lentulo Spiral, Past inject System; n=20 each). Data were analyzed using SPSS version 25.0, with significance set at $p < 0.05$.*

Results: *Among 60 primary molars, the Past inject System showed the highest success rates—clinical (95%), radiographic (95%), and overall (90%)—with the lowest complications (10% discomfort, 5% swelling, 0% retreatment). Lentulo Spiral and Disposable Syringe had lower success (80–90%) and higher complications (up to 20%). Differences were not statistically significant ($p > 0.05$). Baseline characteristics were comparable.*

Conclusion: *The Past inject System demonstrated the highest success and lowest complications, indicating it may be the preferred obturation technique for pulpectomy in primary molars.*

Key Words:
Pulpectomy, Primary teeth, Obturation techniques.

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Introduction

Primary teeth serve as the most effective space maintainers and therefore should be preserved and retained for as long as possible [1]. Dental caries in primary teeth represent one of the most prevalent health issues affecting children worldwide and in many local regions [2]. If left untreated, carious lesions can lead to complications such as pulp involvement, periapical infections, abscess formation, and sinus tracts [3]. These conditions impose considerable direct and indirect burdens on children, their families, and society, while also significantly diminishing the quality of life for affected children.

Pulpectomy in primary teeth is indicated when inflammation extends into the radicular pulp or when the tooth is diagnosed as nonvital [4]. This procedure involves performing a root canal on pulp tissue that is irreversibly infected or necrotic [5]. The root canals undergo cleaning, shaping, and drying, followed by obturation using a resorbable material [6]. Pulpectomy helps preserve a pulpally involved primary tooth by removing infected tissue, microorganisms, and debris, followed by obturation with an antibacterial, resorbable filling material [7,8]. It remains the only viable treatment option for retaining teeth with irreversible pulpitis and periapical periodontitis [9]. However, the success of pulpectomy depends greatly on the quality of obturation, particularly the achievement of a hermetic seal and a void-free, uniform canal fill. Pulpectomy is also contraindicated in certain clinical situations, such as teeth with advanced root resorption or poor restorative prognosis.

Several techniques have been developed for obturating primary root canals, including manual lateral condensation with amalgam pluggers, tuberculin syringes, disposable injection methods, navi tips, hand-held or rotary lentulo spirals, jiffy tubes, endodontic pressure syringes, and past inject systems [10–12]. Among these, the lentulo spiral is the most widely used for delivering root canal paste, while the disposable syringe method is considered simple and effective in minimizing voids [13]. The past inject system has also shown promise, provided high-density material placement and reduced the risk of voids [14]. Nevertheless, no single technique has emerged as the gold standard for obturating primary root canals, and clinical outcomes remain variable.

Despite the variety of obturation techniques available, there remains a lack of consensus on the most effective method for achieving optimal clinical outcomes in pulpectomy of primary teeth. Much of the existing literature focuses on evaluating individual techniques in isolation or under inconsistent clinical settings, making direct comparison challenging. Furthermore, there is a paucity of studies that use standardized criteria to assess both clinical and radiographic success over time. The purpose of the study is to compare the success rate of pulpectomy in primary teeth using different obturation techniques.

Methodology & Materials

This prospective comparative study was conducted at the Department of Dentistry, Bangladesh Shishu Hospital & Institute, from January 2023 to January 2024. A total of 40 children with 60 primary molars requiring pulpectomy were enrolled, selected based on specific inclusion criteria. Data were collected to compare the success rates and postoperative outcomes of three different obturation techniques in primary teeth.

Inclusion Criteria:

Children aged 4–8 years.

At least one primary molar indicated for pulpectomy.

Cooperative behavior (Frankl score 3 or 4).

Medically healthy children.

Exclusion Criteria:

Non-restorable primary molars.

Teeth with pathological root resorption exceeding one-third of the root length.

Grouping and Randomization:

The selected teeth were randomly assigned into three groups (n=20 per group) based on the obturation technique used:

Group A: Disposable Syringe

Group B: Lentulo Spiral

Group C: Pastinject System

Randomization was done using a computer-generated sequence to ensure unbiased allocation.

Clinical Procedure

All procedures were performed under local anesthesia and rubber dam isolation. Standard access opening and biomechanical preparation were carried out using hand

files. Irrigation was done with normal saline and 1% sodium hypochlorite. The canals were then dried and obturated using one of the three techniques based on group allocation. Zinc oxide eugenol was used as the obturating material. Final restoration was completed using a glass ionomer base and stainless steel crown.

Follow-Up and Evaluation

Patients were followed up clinically and radiographically at 3, 6, and 12 months.

Clinical success was defined by the absence of pain, swelling, sinus tract, or mobility.

Radiographic success was defined as the absence of periapical/furcal radiolucency and no progression of root resorption.

Overall success was based on both clinical and radiographic findings.

Postoperative complications such as pain, swelling, and the need for retreatment were also recorded.

Data Analysis

Data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used for demographic and clinical data. The Chi-square test and ANOVA were applied to compare outcomes among the groups, with a p-value < 0.05 considered statistically significant.

Results

A total of 60 primary molars in 40 children were treated using three obturation techniques: Disposable Syringe (n=20), Lentulo Spiral (n=20), and Past inject System (n=20). The mean age of participants was comparable across groups ($p = 0.68$). The distribution of gender and tooth type also showed no statistically significant differences ($p = 0.82$), indicating baseline comparability (Table 1).

Table 1: Demographic and Clinical Characteristics of the Study Population

Characteristic		Disposable Syringe (n=20)	Lentulo Spiral (n=20)	Past inject System (n=20)	p-value
Mean Age (years ± SD)		5.2 ± 1.0	5.5 ± 1.2	5.3 ± 1.1	0.68
Gender	Male	10 (50.0%)	11 (55.0%)	9 (45.0%)	0.82
	Female	10 (50.0%)	9 (45.0%)	11 (55.0%)	
Tooth Type	First Molar	12 (60.0%)	11 (55.0%)	13 (65.0%)	0.82
	Second Molar	8 (40.0%)	9 (45.0%)	7 (35.0%)	

The Past inject System demonstrated the highest rates of clinical (95.0%), radiographic (95.0%), and overall success (90.0%) at 12-month follow-up, compared to the Lentulo Spiral (90.0%, 85.0%, and 80.0%, respectively) and Disposable Syringe (80.0%, 70.0%, and 65.0%, respectively) techniques. While the observed differences favored the Past inject technique, they did not reach statistical significance ($p > 0.05$ for all comparisons), suggesting a positive trend without definitive superiority (Table 2).

Table 2: Success Rates at 12-Month Follow-Up by Obturation Technique

Outcome	Disposable Syringe (n=20)	Lentulo Spiral (n=20)	Past inject System (n=20)	p-value
Clinical Success, n (%)	16 (80.0%)	18 (90.0%)	19 (95.0%)	0.32
Radiographic Success, n (%)	14 (70.0%)	17 (85.0%)	19 (95.0%)	0.10
Overall Success‡, n (%)	13 (65.0%)	16 (80.0%)	18 (90.0%)	0.16

Postoperative complications were lowest in the Past inject group, with only 10.0% experiencing discomfort and no cases of pain requiring retreatment. In contrast, the Disposable Syringe group had the highest complication rates, including 20.0% with post-op discomfort & 10.0% needing retreatment. These findings suggest that Past inject may offer better post-treatment outcomes, although statistical significance was not assessed (Table 3).

Table 3: Postoperative Complications Following Pulpectomy by Obturation Technique

Complication	Disposable Syringe (n=20)	Lentulo Spiral (n=20)	Pastinject System (n=20)
Post-op discomfort, n (%)	4 (20.0%)	3 (15.0%)	2 (10.0%)
Swelling/Abscess, n (%)	3 (15.0%)	2 (10.0%)	1 (5.0%)
Pain requiring retreatment, n (%)	2 (10.0%)	1 (5.0%)	0 (0.0%)

Discussion

This study evaluates and compares the clinical and radiographic success rates of pulpectomy in primary teeth using three different obturation techniques in a pediatric population at a tertiary care dental center in Bangladesh. Pulpectomy, an essential treatment for preserving nonvital or irreversibly inflamed primary teeth, plays a crucial role in maintaining arch integrity and preventing prema-

ture tooth loss. The findings demonstrate notable variations in outcomes across the techniques, with the Past inject System showing a trend toward higher success and fewer postoperative complications. These results emphasize the importance of technique selection in pediatric endodontics and suggest that newer obturation methods may offer improved clinical performance and patient outcomes.

In our study, the mean age of participants across the three obturation technique groups ranged from 5.2 ± 1.0 to 5.5 ± 1.2 years, with no significant difference between groups ($p = 0.68$). These results align with Gandhi et al.[15], who studied 60 primary molars from 41 healthy, cooperative children aged 4 to 9 years, indicating a similar age range typical for pulpectomy in primary teeth. The gender distribution in our sample was balanced, with males comprising 45% to 55% across groups ($p = 0.82$), consistent with the inclusion of both genders reported by Gandhi et al.[15] Regarding tooth type, first primary molars accounted for 55% to 65% of treated teeth, while second molars comprised 35% to 45%, closely reflecting Gandhi et al.'s[15] distribution of 32 primary mandibular first molars and 28 primary mandibular second molars. This comparability in demographic and clinical characteristics supports the representativeness of our sample and the applicability of our findings within pediatric pulpectomy populations.

In the present study, the Past inject system demonstrated the highest clinical (95.0%), radiographic (95.0%), and overall (90.0%) success rates at 12-month follow-up, followed by the Lentulo Spiral and Disposable Syringe techniques. Although these differences were not statistically significant ($p > 0.05$), the observed trend favored the Past inject system. These findings are in agreement with those reported by Gandhi et al.[15], who also noted the highest number of optimally filled canals using the Past inject technique, followed by Lentulo Spiral and Disposable Syringe. Similarly, Raju et al.[16] found that both the Lentulo Spiral and Past inject carrier techniques were comparably effective in achieving homogenous and optimally filled obturations in deciduous teeth. Together, these studies reinforce the clinical utility of carrier-based systems like Past inject in enhancing obturation quality and success outcomes in pulpectomy of primary teeth, even when differences may not be statistically definitive.

In our study, the Past inject System group exhibited the lowest rates of postoperative complications, including post-op discomfort (10.0%), swelling or abscess formation (5.0%), and no cases of pain requiring retreatment. These findings suggest that the Past inject technique may offer superior outcomes in terms of postoperative comfort and clinical stability compared to more conventional methods. This trend is in line with the results reported by Lakshmanan et al.[17], who found that rotary instrumentation techniques—comparable in delivery precision and consistency to the Past inject System—were associated with significantly reduced postoperative pain compared to manual techniques. The lower complication rates observed with Past inject in our study likely reflect the improved control, homogeneity of obturation, and reduced risk of extrusion, which contribute to better healing and fewer adverse outcomes. Thus, our findings reinforce the potential advantages of newer obturation systems in minimizing post-treatment morbidity in primary teeth.

Limitations of the study

This study had some limitations:

- The study was conducted in a selected tertiary-level hospital.
- The sample was not randomly selected.
- The study's limited geographic scope may introduce sample bias, potentially affecting the broader applicability of the findings.

Conclusion

The Past inject System showed the highest overall success and the fewest postoperative complications, followed by the Lentulo Spiral and Disposable Syringe methods. Baseline factors like age, gender, and tooth type were similar across groups. The Past inject technique demonstrated a positive trend toward better clinical outcomes and patient comfort, suggesting it may be a preferable option for pulpectomy in primary molars.

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